

Integrated PEMFC Flow Field Design Concept for Gravity Independent Passive Water Removal, Phase I

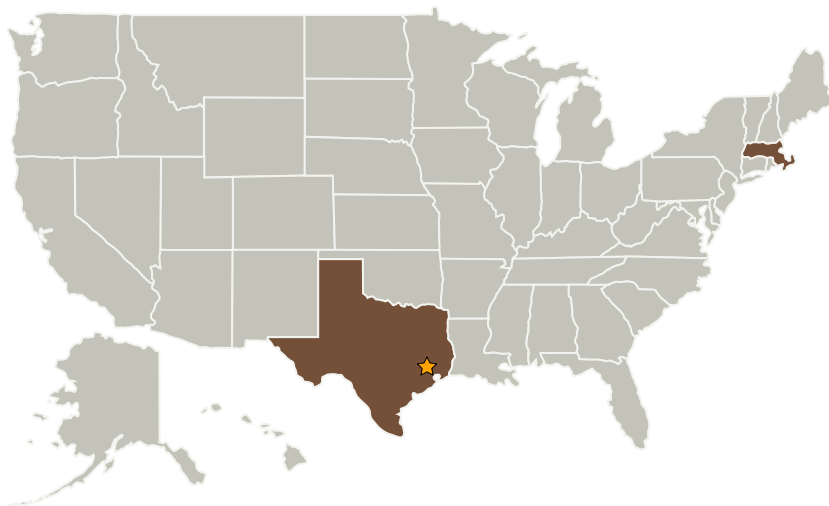
Completed Technology Project (2006 - 2006)



Project Introduction

The primary power systems for Space Shuttles and future space vehicles are based on fuel cells. Due to inherent fundamental performance, safety and reliability, NASA is interested in replacing the present alkaline fuel cell system with PEM systems. However, the conventional use by PEM systems of O₂ reactant gas recirculation to remove product water, enhance cell uniformity, and control humidity could pose a serious safety concern. A fundamentally new PEM fuel cell design concept is proposed that removes liquid product water by controlled convection and wicking through layered porous structures that are integrated into each cell separator plate. This unique integrated flow field (IFF) concept also automatically and passively clears channels blocked by droplets. Furthermore, the same design includes transport of product water back to the entire flow field for humidification and greater cell performance. The IFF design enables high pressure and high voltage operation resulting in higher efficiency. For removal of product water vapor from the cell, the design concept includes ejectors to passively generate a modest gas circulation. In conclusion, this design innovation will significantly simplify the PEM operating system while generating higher performance and foster greater long-term safety in zero-g as well as ordinary gravity applications.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
ElectroChem, Inc.	Supporting Organization	Industry Minority-Owned Business, Women-Owned Small Business (WOSB)	Woburn, Massachusetts

Primary U.S. Work Locations

Massachusetts	Texas
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
 - └ TX03.2 Energy Storage
 - └ TX03.2.2 Electrochemical: Fuel Cells